

applying and regulating cold dry air into said impeller;  
filtering said air at said impeller with at least two filters; and  
forcing said native Dead Sea minerals through said conical screen mill with said impeller and into a collecting bin.

8. (Amended) The method of processing native Dead Sea minerals into an ultra fine mineral compound of Claim 7 wherein said filtering step [at least two filters comprise a filter that] comprises the step of removing [removes] moisture and particulates from said air [and one filter that is a carbon filter].

The clean rewritten version of Claims 5 and 8 is contained in Exhibit A.

### **REMARKS**

#### **A. Restriction Requirement**

Examiner required an election between Claims 1-9 drawn to a process and apparatus for mineral processing classified in class 241, subclass 23; Claims 10-13 drawn to a cosmetic composition, classified in class 424; and Claim 14 drawn to a process for forming a cosmetic preparation classified in class 424. Applicants elect Claims 1-9 without traverse.

#### **B. Specification**

Examiner requested the deletion of all footnotes used throughout the specification. The text of the footnotes has been incorporated into the primary text of the specification. A substitute specification showing changes made is attached as Exhibit B. A clean version of the substitute specification is attached as Exhibit C. The substitute specification contains no new matter.

### C. Claim Rejections

Examiner allowed Claims 1-4, but rejected Claims 5-9 under 35 U.S.C. §112, second paragraph as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicants regard as their invention. Claim 5 has been amended to include more definite language and therefore should now be allowable. Claim 8 has been amended to clarify the process step being claimed. Claims 6-9 being dependent on these amended claims should now be allowable as well.

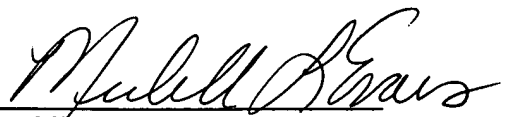
Applicants have considered all points made by the Examiner in the Office Action dated April 8, 2003 and have incorporated Examiner's suggestions to ensure compliance with the applicable rules. In view of the above, it is submitted that Claims 1-9 are in a condition for allowance. Reconsideration and withdrawal of the objections is respectfully requested.

If impediments to allowance of claims 1-9 remain and a telephone conference between the undersigned and the examiner would help remove such impediments in the opinion of the examiner, a telephone conference is respectfully requested.

Respectfully submitted,

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By:

  
Michelle L. Evans  
Reg. No. 44,673

5. (Amended) A method of processing native Dead Sea minerals into an ultra fine mineral compound comprising the steps of:

transporting said native Dead Sea minerals into a processor comprising a conical screen mill with impeller;

applying and regulating cold dry air into said impeller;

filtering said air at said impeller with at least two filters; and

forcing said native Dead Sea minerals through said conical screen mill with said impeller and into a collecting bin.

8. (Amended) The method of processing native Dead Sea minerals into an ultra fine mineral compound of Claim 7 wherein said filtering step comprises the step of removing moisture and particulates from said air.

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**IN THE UNITED STATES  
PATENT AND TRADEMARK OFFICE**

**TITLE:**

Ultra Fine Dead Sea Mineral Compound and Method of Manufacture

**INVENTORS:**

Morris (NMI) Samelson  
Johnathan M. Scharff



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APR 23 2003

Technology Center 2600

**BACKGROUND OF THE INVENTION**

**1. Field of The Invention**

Applicant's invention relates to an ultra fine mineral compound and a method of processing native Dead Sea minerals into this ultra fine mineral compound that can be used to manufacture all-natural Dead Sea mineral compositions particularly compositions for use in cosmetic preparations such as bath and body products.

**2. Background Information**

A cosmetic product is any substance or preparation intended for placing in contact with the various external parts of the human body or with the teeth or mucous membranes of the oral cavity with the intention of cleaning, perfuming, or protecting, to keep such parts in good condition, change their appearance or correct body odors. There are numerous product groups that fall within the category of cosmetic products or preparations, including but not limited to cosmetic emulsions, deodorants and antiperspirants, sunscreens, make-up preparations, hair preparations, bath products, soaps, exfoliating agents, and shaving preparations.

Cosmetic preparations are usually mixtures<sup>[1]</sup>. A mixture is any matter consisting of two or more substances physically combined in some proportion by

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[A mixture is any matter consisting of two or more substances physically combined in some proportion by mass. In a mixture there is no chemical reaction.]

1 mass. In a mixture there is no chemical reaction. Two types of mixtures are  
2 heterogenous mixtures and homogenous mixtures. A heterogenous mixture is a  
3 mixture having ingredients of different states of matter. A suspension is a  
4 heterogenous mixture in which droplets or particles are suspended in a liquid. A  
5 colloidal dispersion is a specific type of suspension in which the particles or droplets  
6 of one substance are smaller than those in suspensions , but larger than those in  
7 solutions and that have one dimension in the range of 1 to 10 nm. A homogenous  
8 mixture is a mixture having ingredients of the same states of matter. Homogenous  
9 mixtures are usually solutions which are made up of a solute dissolved in a solvent.  
10 When the solute does not remain dissolved in the solvent the mixture is in turn  
11 referred to as a heterogenous mixture.

12 Many cosmetic preparations are suspensions and more particularly colloidal  
13 dispersions. In a colloidal dispersion there is a suspension of finely divided particles  
14 in a continuous medium in which the particles do not settle out of the substance  
15 rapidly and are not readily filtered. Where the particle is a liquid droplet and the  
16 medium is a liquid, the colloid is referred to as an emulsion. If however the particle  
17 is a solid and the medium is a liquid, the colloid is referred to as a sol<sup>[2]</sup> or gel<sup>[3]</sup>. A

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<sup>2</sup> [A sol is a colloidal dispersion of a solid in a liquid in which the particles are so small that the dispersion appears transparent.]

<sup>3</sup> [A gel is a suspension that behaves as an elastic solid or semi-solid rather than liquid.]

1 sol is a colloidal dispersion of a solid in a liquid in which the particles are so small  
2 that the dispersion appears transparent while a gel is a suspension that behaves as  
3 an elastic solid or semi-solid rather than liquid.

4 Colloidal systems undergo agglomeration, or gathering into a mass, leading to  
5 a distribution of droplet size for liquid colloids. Though wetting phenomena and  
6 nonwetting colloidal factors may play a role, the agglomeration process is induced  
7 by particulate collisions arising from diffusion, as in Brownian motion, velocity or  
8 shear gradients in a liquid dispersion medium, and gravitational settling.

9 Irreversible agglomeration can be quantified using various models for  
10 repulsive or attractive electrostatic, London- van der Waals, and steric forces which  
11 affect stabilization of aqueous and nonaqueous colloidal systems. A comprehensive  
12 model of colloidal stability, the DLVO (Derjagun-Landau-Verwey-Overbeek) model  
13 has provided information regarding the roles of electrolytes, dielectric constant, and  
14 other physical quantities in colloidal systems. This theory considers the electrostatic  
15 interactions between two identically charged, suspended particles to be repulsive  
16 and to arise from the overlap of the electrical double layers associated with each  
17 particle.

18 For systems containing a soluble polymer or surfactant, molecular  
19 arrangement, thickness of the absorbed layer, temperature, and chain or segment  
20 solvation are additional critical parameters in determining the effectiveness of a  
21 dispersed agent in providing steric stabilization. If velocity or shear gradients are

1 present, such as in mixing, and are sufficiently large, the frequency of collisions  
2 depends on the volume fraction of solids and the mean velocity gradient. Assuming  
3 that sedimentation is slow compared to the first two collision mechanisms, the  
4 overall agglomeration rate is

$$5 \quad -dN/dt = k_d N^2 + k_s N$$

6 where  $N$  is the particle number concentration,  $k_d$  and  $k_s$  are the respective  
7 rate constants corresponding to diffusion controlled and shear induced collision  
8 processes, and the minus sign denotes that the particle number concentration  
9 decreases with time.

10 Cosmetic emulsions, such as lotions and creams, are emulsions of water-  
11 based and oil-based phases. An emulsion is more particularly a two phase system  
12 consisting of two incompletely miscible liquids, the internal or discontinuous phase  
13 dispersed as finite globules in the other termed the continuous phase. Emulsions  
14 can be classified according which liquid is dispersed in the continuous phase. Oil in  
15 water (o/w) emulsions have oil as the dispersed phase in water as the continuous  
16 phase. In water in oil (w/o) emulsions, the water is dispersed in the oil as the  
17 continuous phase.

18 Products that produce emulsions, or emulsifiers, can be classified as ionic or  
19 nonionic according to their behavior. An ionic emulsifier is composed of an organic  
20 lipophilic group and a hydrophilic group. The hydrophilic-lipophilic balance is often  
21 used to characterize emulsifiers and related surfactant materials. The ionic types



1 may be further divided into anionic and cationic, depending on the nature of the ion-  
2 active group. The lipophilic portion of the molecule is usually considered to be the  
3 surface active portion. Nonionic emulsifiers are completely covalent and show no  
4 apparent tendency to ionize. Emulsifiers, being surface active agents, lower surface  
5 and interfacial tensions and increase the tendency of their solution to spread.

6         Mixing of cosmetic preparations is an important operation particularly in the  
7 preparation of heterogenous mixtures such as suspensions and colloids since the  
8 actual steps involved can dictate whether the particles or droplets remain suspended  
9 continuously throughout the medium for a reasonable period of time to maintain an  
10 adequate shelf life and viability of the preparation. This becomes increasingly  
11 difficult when the desire of the manufacturer is to produce cosmetic preparations  
12 that contain all natural<sup>[4]</sup> ingredients. Natural ingredients refer to ingredients  
13 obtained from nature such as extracted directly from plants or animal products as  
14 opposed to being produced synthetically.

15         The present composition contains all natural ingredients. One of the natural  
16 ingredients incorporated into the composition of the present invention is Dead Sea  
17 minerals. Dead Sea minerals are not to be confused with sea salt<sup>[5]</sup> or afro-

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\*         [Natural ingredients refer to ingredients obtained from nature such as extracted directly from plants or animal products as opposed to being produced synthetically. ]

<sup>5</sup>         [Sea salt is the compound remaining when oceanic sea water is evaporated. It contains primarily sodium and chloride and in some cases trace amounts of copper, manganese, nickel, fluorine, tin and iodine. The trace minerals can vary based upon the source of the sea water.]

1 salt<sup>6</sup>]which has a different chemical composition. Sea salt is the compound  
2 remaining when oceanic sea water is evaporated. It contains primarily sodium and  
3 chloride and in some cases trace amounts of copper, manganese, nickel, fluorine,  
4 tin and iodine. The trace minerals can vary based upon the source of the sea water.  
5 Afrosalt® is a compound of inorganic salts derived from seawater containing 45% ±  
6 31 sodium, 53% ± 3 chlorides, 3.6% magnesium, <7% sulphates, <3% calcium,  
7 <2% bromides, 0.49% ± 0.04 potassium, <0.3% iodides. The Dead Sea is a  
8 unique body of water, unlike any other and has a singular chemical composition.  
9 For years it has been known that treatments administered at the Dead Sea can bring  
10 about significant remissions in diseases such as psoriasis, psoriatic arthritis,  
11 rheumatoid arthritis, and osteoarthritis.

12 It is not known what the mode of action is of the Dead Sea minerals. It is  
13 however believed that specific ions from the minerals play a role mainly as co-  
14 factors in enzymatic regulation activities in the metabolism of healthy skin. There  
15 are indications that magnesium is a co-factor for phosphate transferring enzymes  
16 and participates in c-AMP c-GMP balancing regulation, potassium may enhance CO<sub>2</sub>  
17 transport, and calcium is thought to regulate cell membrane permeability. Zinc may

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<sup>6</sup> [Afrosalt® is a compound of inorganic salts derived from seawater containing 45% ± 31 sodium, 53% ± 3 chlorides, 3.6% magnesium, <7% sulphates, <3% calcium, <2% bromides, 0.49% ± 0.04 potassium, <0.3% iodides.]

1 play a role as a co-factor in cell proliferation enzymatic regulation.

2 Electrolytes can be absorbed into the skin from mineral rich preparations.

3 The skin is a multilayered membrane with certain absorption characteristics which  
4 are subject to change. Corneum cell walls are involved in the semi-permeable  
5 membrane system and are responsible for the osmotic properties of the corneum.

6 The penetration of the electrolytes through the stratum corneum occurs in between  
7 the horny cells.

8 There are models that demonstrate specific ionic absorption through the  
9 human skin barrier. Concentration is the key. When applying a cosmetic  
10 preparation, the relevant concentration is the concentration gradient between each  
11 specific dissolved ion both outside and inside the skin surface. During the  
12 absorption process, a partitioning of minerals occurs from the vehicle to the skin.

13 The nature of the cosmetic preparation is significant in determining the kinetics of  
14 mineral skin penetration. Another important factor is the pH in the various  
15 microenvironments of the skin. Ions in varying valences and cations in combination  
16 with different anions penetrate to differing extents. There are major differences in  
17 the extent of skin penetration in different areas of the body.

18 The face is one of the highest absorbing areas. Exposed surface area,  
19 frequency of dermal application, skin type, skin age, temperature, and contact time  
20 should be considered. Factors involved in the percutaneous absorption of cosmetic  
21 preparations include use of other topical or systemic drugs, application parameters

1 such as area, amount, frequency, massage; formulation such as concentration,  
2 nature of the vehicle, occlusivity, pH; formulation components such as solvents,  
3 surfactants, perfumes, dyes, inert ingredients, active ingredients, preservatives,  
4 impurities; skin damage such as abrasion, detergents, organic solvents, climatic  
5 factors; and physiological factors such as nature of the skin, anatomical site,  
6 individual factors and hydration. Assuming electrolytes can be absorbed into the  
7 skin, dermal application of mineral rich cosmetics can prove beneficial. The goal  
8 therefore has been to incorporate the beneficial properties of the Dead Sea into  
9 cosmetics.

10 Over the past few years cosmetics have been marketed that incorporate Dead  
11 Sea minerals, including body and face masks with highly viscous dispersions, lotions  
12 and creams with the minerals in very low concentrations, and one phase aqueous  
13 solutions with the minerals in very low concentrations. The composition of Dead  
14 Sea minerals is very unique. The concentration of the divalent cations magnesium  
15 and calcium is very high compared with the monovalent cations, mainly sodium and  
16 potassium. In addition, the ionic strength of a solution of these minerals is very  
17 high. These two factors have a tremendous negative effect on the formation and  
18 stability of dispersions and emulsions, and strictly limit their concentration to a few  
19 percent of the weight of conventional cosmetic formulations.

1           As mentioned previously, according to the DLVO theory stabilization of  
2   dispersions of emulsions can be described as the result of the combined attraction  
3   and repulsion forces between the particles or droplets that are dispersed in  
4   continuous phases. For example, oil in water emulsions can be stabilized by the  
5   absorption of ionic surfactants onto the oil droplet surface which may become  
6   positively or negatively charged. The electric surface potential will cause repulsion  
7   between the approaching droplets. If the repulsion forces overcome the attraction  
8   forces the emulsion will be stable. The electric surface potential is strongly  
9   dependent on electrolyte concentration and on the valence of the counter ion in the  
10   solution. Therefore, the electrical repulsion is significantly reduced in systems that  
11   contain high concentrations of electrolytes in general, and divalent counterions in  
12   particular. This results in difficulties in formulating a cosmetic emulsion that  
13   contains electrolytes from the Dead Sea that is rich in magnesium and calcium  
14   divalent cations at high concentrations, and will be stable for the minimum required  
15   shelf life for a cosmetic product. In addition, the high concentration of electrolytes  
16   may cause salting out and precipitation of various components of any cosmetic  
17   preparation. This may also affect the texture and the appearance of the product, its  
18   viscosity, hydrophilic-lipophilic balance, crystallization, etc.

19           The present invention provides for a chemical composition for application to  
20   the skin comprising a mixture of at least 50% processed ultra fine Dead Sea mineral  
21   particles in a continuous all natural carrier medium where in the Dead Sea mineral

1 particles do not rapidly settle out of the carrier medium which promotes a more shelf  
2 stable product. This chemical composition takes advantage of the ionic properties of  
3 the Dead Sea minerals and contains minerals of such a fine granularity that  
4 exfoliation is not as harsh to the skin, particularly of persons suffering from severe  
5 skin disorders. In addition, the carrier medium of the present invention contains all  
6 natural ingredients and is non-comedogenic so consumers do not have to be  
7 concerned about clogged pores.

8 The problems of the prior art are overcome by the present invention by  
9 processing the Dead Sea minerals into an ultra fine mineral compound and mixing  
10 this ultra fine mineral compound with select natural ingredients using a unique swift  
11 heating, chilling and mixing technique to produce cosmetic preparations, such as  
12 body scrubs, rubs, muds, creams, lotions, and related preparations. These cosmetic  
13 preparations contain greater than 50% concentration of Dead Sea minerals but  
14 maintain stability and preferable shelf life with a pleasant feel for the consumer.

#### 15 **SUMMARY OF THE INVENTION**

16 It is an object of the present invention to provide a novel method for  
17 processing native Dead Sea minerals into an ultra fine mineral compound.

18 Still another object of the present invention is to provide a novel ultra fine  
19 mineral compound.

20 It is another object of the present invention to provide a novel method for  
21 using manufactured ultra fine Dead Sea minerals to manufacture all natural Dead

1 Sea mineral compositions.

2 Another object of the present invention is to provide novel Dead Sea mineral  
3 compositions.

4 Yet another object of the present invention is to provide novel Dead Sea  
5 mineral body scrubs, rubs, muds, creams, lotions, and related preparations.

6 It is still another object of the present invention to provide a novel Dead Sea  
7 mineral body scrub that remains in suspension to sustain shelf life.

8 It is an additional object of the present invention to provide a novel Dead Sea  
9 mineral body scrub that is made from all natural ingredients.

10 Still another object of the present invention is to provide a novel body scrub  
11 that has as its primary ingredient Dead Sea minerals.

12 It is yet another object of the present invention to provide novel Dead Sea  
13 mineral compositions that provide the optimal concentration of each specific ion in  
14 skin cells.

15 Still another object of the present invention is to provide novel Dead Sea  
16 mineral compositions that provide a pleasant feel for the consumer.

17 An additional object of the present invention is to provide novel Dead Sea  
18 mineral compositions that provide the optimal delivery vehicle for the various ionic  
19 compounds.

20 Another object of the present invention is to provide novel Dead Sea mineral  
21 compositions that are not irritating to the skin.

1 In satisfaction of these and related objectives, Applicant's present invention  
2 provides an ultra fine mineral compound and a method of processing native Dead  
3 Sea minerals into this ultra fine mineral compound that can be used to manufacture  
4 all natural Dead Sea mineral compositions particularly compositions for use in bath  
5 and body products.

#### 6 **BRIEF DESCRIPTION OF THE DRAWINGS**

7 Fig. 1 is a flowchart of the organization of manufacture for the preferred  
8 embodiment of the present invention.

9 Fig. 2 is a perspective view of the conical screen mill system of the present  
10 invention manufacturing process.

11 Fig. 3 is a perspective view of the unique swift heating, chilling and mixing  
12 system of the present invention.

13 Fig. 4 is a perspective view of the tube packager of the present invention.  
14

#### 15 **DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT**

16 Referring to Fig. 1, a flowchart of the organization of manufacture for the  
17 preferred embodiment of the present invention is shown. The Dead Sea mineral  
18 compositions and method for manufacture begins with the native Dead Sea minerals  
19 at step 101. The native Dead Sea minerals are typically composed of 31.0 - 35.0%  
20 magnesium chloride, 20.0-28.0% potassium chloride, 3.0-8.0% sodium chloride,  
21 0.1-0.5% calcium chloride, 0.3-0.6% bromide, 0.05-0.2% sulfates, 0-0.3%



1 insoluble minerals, and 32.0-40.0% water of crystallization. These values have a  
2 standard deviation of  $\pm 1\%$ . These native Dead Sea minerals are next subjected to  
3 ultra fine processing at step 102. A perspective view of the conical screen mill and  
4 impeller system 103 is illustrated in more detail in Fig. 2. In the ultra fine  
5 processing, the native Dead Sea minerals are initially held in a hopper 112, that is  
6 preferably nonmetal, dispensed to a screw conveyor 113 and transported through a  
7 primary opening 114 into a second hopper 150. From second hopper 150, the  
8 native Dead Sea minerals are dispensed into a processor 115 that contains a conical  
9 screen mill with an impeller system 103 having preferably a dual headed impeller  
10 103b. Once in the processor 115, the native Dead Sea minerals enter into the  
11 conical screen mill 103a. Within the conical screen mill 103a, the impeller 103b  
12 forces the native Dead Sea minerals through the conical screen 103a into a third  
13 hopper 104 thereby reducing the size of the native Dead Sea minerals and forming  
14 an ultra fine mineral compound. The conical screen mill with impeller system 103  
15 not only reduces the particle size of the native Dead Sea minerals, but also keeps  
16 insoluble materials, such as pieces of hard mineral or rocks, from getting through so  
17 the ultra fine minerals that are formed are essentially "rock-free". The initial  
18 granularity of the native Dead Sea minerals is typically 31.3% passing through US  
19 sieve 20 mesh, 40.2% passing through US sieve 40 mesh, 24.6% passing through  
20 US sieve 60 mesh, 2.5% passing through US sieve 80 mesh, 0.4% passing through  
21 US sieve 100 mesh, and 0.2% passing through US sieve 120 mesh, 0.4% passing

1 through US sieve 200 mesh, and 0.3% pan. Simply, the preferred native minerals  
2 used in the present process have at a minimum 90% less than 10 mesh and 90%  
3 less than 1.7 mm size granularity. However, another grade of native minerals that  
4 can be used in the present process has a screen analysis that has at a minimum  
5 greater than 90% between 5 and 10 mesh and greater than 90% between 1.7mm  
6 and 4.0 mm size granularity. In contrast, the granularity of the ultra fine minerals  
7 consist of typically 0.0% passing through US sieve 20 mesh, 22.7% passing  
8 through US sieve 40 mesh, 29.6% passing through US sieve 60 mesh, 11.5%  
9 passing through US sieve 80 mesh, 4.9% passing through US sieve 100, 3.4%  
10 passing through US sieve 120, 9.7% passing through US sieve 200, and 18.2%  
11 pan.

12 A finer version of the minerals can also be obtained with a granularity of the  
13 minerals consisting of typically 0.0% passing through US sieve 20 mesh, 0.4%  
14 passing through US sieve 40 mesh, 16.0% passing through US sieve 60 mesh,  
15 15.0% passing through US sieve 80 mesh, 8.7% passing through US sieve 100  
16 mesh, 5.5% passing through US sieve 120 mesh, 16.2% passing through US sieve  
17 200 mesh, and 38.1% pan. The granularities for each of the minerals have a  
18 deviation of  $\pm 10\%$ . The processing step for any version of the minerals ensures  
19 that 100% will have less than 10 mesh and 100% will have less than 1.0mm size  
20 granularity.

21 At the primary opening of the processor 115, a specially fitted hose 119 is

1 placed to regulate air into the impeller portion. This air originates from an attached  
2 air compressor 158. Before entering the impeller portion, the air passes through a  
3 pressure regulator 159 and through an air dryer 160. In addition, this air is filtered  
4 with preferably two filters, one filter 151 that removes moisture and particulates and  
5 one carbon filter 152. By maintaining a cool, dry positive pressure environment the  
6 level of heat and moisture in the process remains low enabling the chemical  
7 composition to remain natural without the necessity of adding non-natural "free  
8 flowing" or "anti-caking" agents that would alter the natural composition. A  
9 secondary opening exists between the conical screen mill and impeller system 103  
10 and third hopper 104 to allow for collection, but the remainder of this portion of  
11 processor 115 is kept closed with a cover 120, being preferably cotton or canvas,  
12 to prevent the ultra fine particulate from escaping into the air and causing possible  
13 respiratory problems and to prevent unnecessary moisture from entering the ultra  
14 fine minerals and altering their chemical coordination.

15 A nuisance collection tube 105, having a collection fitting, is placed adjacent  
16 opening 153 of third hopper 104 for super fine nuisance particulate debris  
17 collection into a nuisance collection receptacle 106. The processed ultra fine  
18 minerals are next conveyed along a screw type conveyor 121 to liner bags 154  
19 within fibre drums or barrels 107 placed on a scale 155. A second nuisance  
20 collection tube 156 is placed from the screw type conveyor 121 for debris collection  
21 into a second nuisance collection receptacle 157. When 65kg. of ultra fine minerals

1 are collected, the scale 155 automatically stops the screw type conveyor 121. All  
2 of the air is removed from the liner bag 154, the liner bag 154 is lock tied, and the  
3 barrel 107 closed. The barrel 107 is then transported to a pallet (not shown) for  
4 shipment 108. Both the native Dead Sea minerals and the ultra fine processed  
5 minerals are highly hygroscopic and therefore the entire process occurs in a modified  
6 room atmosphere with a temperature no higher than 78 degrees Fahrenheit with  
7 cool, dry positive pressure.

8       Once the ultra fine minerals are prepared they can then be mixed at the  
9 mixing stage 109 into a Dead Sea mineral composition. The mixing step is  
10 illustrated in more detail with the perspective view of the swift heating, chilling and  
11 mixing system of Fig. 3. Mixing performance is evaluated primarily by the physical  
12 uniformity of the ultimate composition. The elements of the mixer design are the  
13 process design, such as the fluid mechanics of the impeller, fluid regimen required  
14 by the process, scale-up, and hydraulic similarity; impeller power characteristics,  
15 including speed and diameter; and mechanical design of the mixer, such as the  
16 impeller, shafts and drive assembly.

17       In preparing the Dead Sea mineral composition of the present invention it is  
18 important to consider the fluid mechanics of the mixing process. Mixer power,  $P$ ,  
19 produces a pumping capacity  $Q$  expressed in kg/s, and a specific velocity work term  
20 of the head  $H$  expressed in J/kg according to the formula:

21       
$$P=QH$$

1           where the term H is related to the square of the velocity and therefore to fluid  
2 shear rates. If the process is dependent primarily upon the pumping capacity, the  
3 fluid velocities and the individual shear rates, both on a macro- and a micro-scale  
4 are above a certain minimum level to allow other process requirements to proceed  
5 unhindered. If the pumping capacity is increased and some of the other velocity and  
6 shear rate values are decreased below some minimum, then fluid shear stress enters  
7 into the overall design.

8           When mixing the Dead Sea mineral composition of the present invention  
9 which involves at its simplest level a solid and at least one liquid, the settling  
10 velocity of the solid particles as well as the final viscosity of the suspension are  
11 critical factors in the process design as the ultimate goal is to obtain a composition  
12 that can be used as a cosmetic preparation with complete uniformity of the solid  
13 throughout the suspension that can be maintained not only through the mixing  
14 period, but also for a reasonable time thereafter for an adequate shelf life.

15           The process for preparing the Dead Sea mineral composition of the present  
16 invention utilizes water for many of its operations. The water originates from a local  
17 water source 168, then passes into a deionizer 169. The deionized water is then  
18 supplied to a boiler 170 and a chiller unit 123. Air is also incorporated into the  
19 system which originates from air compressor 171. The air passes from air  
20 compressor 171 through a pressure regulator 172 into an air dryer 173 to create  
21 cool dry air. The air then passes through a filter 174 and water trap 175 in process

1 vessel 122. The process begins by heating the process vessel 122 and setting the  
2 temperature control on control panel 134 to 65 degrees Celcius to open the heat  
3 valves 124a and inject hot water from boiler 170 into the process vessel 122  
4 jacket around the surrounding inside wall of the process vessel 122. Once  
5 circulated through process vessel 122 jacket, the water is returned out valve 124d.  
6 Liquid palm oil is added to vessel 122 once the vessel 122 begins to heat. When  
7 the temperature has reached at least 35 degrees Celcius, beeswax, jojoba wax PEG  
8 120, cashew husk oil ethoxylate, and coconut oil are added to the process vessel  
9 122 to begin melting. Scrape surface 163 agitation and triple impeller 164  
10 agitation are turned on from control panel 134 at slow speed to mix (these are  
11 attached to a variable speed controlled motor). When these ingredients have  
12 reached 65 degrees Celcius and are melted thoroughly together then soybean oil,  
13 olive oil, jojoba oil, and vitamin E oils (Covitol 1250 and Covi-ox) are added. The  
14 speed of the scrape surface agitation and the triple impeller agitation are increased  
15 to medium. The heating is then turned off and the flow of hot water to the process  
16 vessel jacket 122 is closed. Turbine 165 agitation is then turned on within the  
17 process vessel 122 for high speed homogenous agitation or mixing. The ultra fine  
18 minerals are added and higher speed mixing with scrape surface 163 agitation and  
19 triple impeller 164 agitation is continued. The ultra fine minerals help to reduce the  
20 temperature. A chiller unit 123 is turned on and flow valves 125 are opened to  
21 circulate chilled water. The chiller unit 123 is itself chilled by an external cooling

1 source such as a local water supply 168. The temperature control on the process  
2 vessel 122 is then set to 45 degrees Celcius to open the cooling valves 124b to the  
3 process vessel 122. The cold water is circulated through the process vessel 122  
4 jacket and returned through valve 124c to chiller unit 123. Triple motion mixing is  
5 continued until the batch temperature reaches 45 degrees Celcius. Mixing of the  
6 batch with triple motion is continued at 45 degrees Celcius for another 15 minutes.  
7 The temperature control on control panel 134 is then set to 42 degrees Celcius and  
8 an essential oil blend is added (which is weighed and blended earlier) and mixing is  
9 continued. The batch is maintained at 42 degrees Celcius while mixing for 20-25  
10 minutes. The temperature control on the process vessel 122 is then set to 40  
11 degrees Celcius and mixing is continued. When the temperature of the batch  
12 reaches 40 degrees Celcius, package tubes can then be filled. At this stage, the  
13 batch is pumped from the process vessel 122 using pump 166 with a pressure  
14 regulator 167 to a holding hopper 126 at the filling station 128 of a tube packager  
15 110. The tube packager 110 is illustrated in more detail in Fig. 4. As the level of  
16 the batch goes down in the holding hopper 126, the level sensor 176 signals the  
17 pump 166 to pump over more. The holding hopper 126 is covered except for the  
18 tube 127 that enters from the process vessel 122 due to the delicate nature of the  
19 batch product. Empty tubes are placed into a distribution station 135 and upon  
20 actuating the filling station 128 of the tube packager 110 the empty tubes are  
21 placed at station 129, oriented at station 130, filled at station 131, sealed at

station 132, and trimmed into a final packaged Dead Sea mineral composition at station 133 ready for shipment 111. The tubes are preferably coextruded tubes with a barrier of protection between the mineral composition and the reactant tube surface.

The final Dead Sea mineral composition that can be used for cosmetic preparations such as body scrubs, rubs, muds, creams, lotions, and related preparations contains ultra fine Dead Sea minerals, palm oil, soybean oil, olive oil, jojoba oil, beeswax, essential oil blend, jojoba wax PEG 120, cashew husk oil ethoxylate, coconut oil, natural source Vitamin E oil (or d-alpha tocopherol), Vitamin E oil (or natural mixed tocopherols) used as antioxidant. The preferred essential oil blend includes rosewood, lavender, chamomile, and calendula.

Where the final composition is a body scrub, it contains preferably approximately 51% ultra fine Dead Sea minerals, 25% palm oil, 9.0% soybean oil, 5.0% olive oil, 3.0% jojoba oil, 3.0% beeswax, 1.0% essential oil blend, 1.0% jojoba wax PEG 120, 1.0% cashew husk oil ethoxylate, 1.0% coconut oil, 0.1% natural source Vitamin E oil or d alpha tocopherol, 0.05% Vitamin E oil or natural mixed tocopherols. The preferred essential oil blend for the body scrub includes 0.44% rosewood, 0.34% lavender, 0.20% chamomile, and 0.02% calendula. Even with the extreme ionic character of the Dead Sea minerals, the Dead Sea mineral compositions prepared remain in suspension creating a viable cosmetic preparation that can maintain adequate shelf life and provide a more pleasant feel for the



1 consumer.

2 Conventional methods, known to those of ordinary skill in the art of  
3 cosmetics, can be used to administer the formulation of the present invention to a  
4 user; however, the preferred administration will be by transdermal delivery.

5 Although the invention has been described with reference to specific  
6 embodiments, this description is not meant to be construed in a limited sense.

7 Various modifications of the disclosed embodiments, as well as alternative  
8 embodiments of the inventions will become apparent to persons skilled in the art  
9 upon the reference to the description of the invention. It is, therefore, contemplated  
10 that the appended claims will cover such modifications that fall within the scope of  
11 the invention.

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